

CPC**COOPERATIVE PATENT CLASSIFICATION****F24J****PRODUCING OR USE OF HEAT NOT OTHERWISE PROVIDED FOR**

(materials therefor [C09K 5/00](#); engines or other mechanisms for producing mechanical power from heat, see the relevant classes, e.g. F03G for using natural heat)

F24J 1/00

Apparatus or devices using heat produced by exothermal chemical reactions other than by combustion (for cooking-vessels [A47J 36/28](#); self-heating compresses [A61F](#){[A61F 7/04C](#)}; materials for the production of heat or cold involving non-reversible chemical reactions, other than by combustion, when used [C09K 5/18](#))

F24J 2/00

Use of solar heat, e.g. solar heat collectors (distillation or evaporation of water using solar energy [C02F 1/14](#); devices for producing mechanical power from solar energy [F03G 6/00](#); semiconductor devices adapted for converting solar energy into electrical energy [H01L 25/00](#), [H01L 31/04](#); semiconductor devices including arrays of solar cells using heat energy [H01L 31/058](#); generators in which light radiation is directly converted into electrical energy [H02N 6/00](#))

F24J 2/0007

- . {Passive solar heat collectors}

F24J 2/0015

- . {Solar heat collectors absorbing essentially direct solar radiation combined with a solar heat collector absorbing concentrated radiation}

F24J 2/0023

- . {Solar heat collector using additional ambient air heat or another heat source, e.g. electrical}

F24J 2/02

- . Solar heat collectors with support for article heated, e.g. stoves, ranges, crucibles, furnaces or ovens using solar heat

F24J 2/04

- . Solar heat collectors having working fluid conveyed through collector

F24J 2/0422

- .. { Solar collectors integrated in fixed constructions, e.g. in buildings}

F24J 2/0427

- ... { in the form of a fence, a balustrade or a handrail}

F24J 2/0433

- ... {in the form of a window}

F24J 2/0438

- ... {in the form of a floor construction}

F24J 2/0444

- ... {in the form of a façade construction}

F24J 2/045

- ... {in the form of a roof construction ([F24J 2/0455](#) takes precedence)}

F24J 2/0455

- ... {in the form of shingles or tiles}

F24J 2/0461

- .. { using pools or ponds}

F24J 2/0466

- ... { Salt gradient solar ponds}

F24J 2/0472

- ... { Floating solar collectors or covers}

F24J 2/0477

- .. { having circuits for more than one working fluid ([F24J 2/30](#) takes precedence)}

F24J 2/0483

- .. { having two or more passages for the same working fluid ([F24J 2/20](#), [F24J 2/24](#) take precedence)}

F24J 2/0488

- .. { Solar heat collectors having absorber surfaces of a particular form}

F24J 2/0494

- ... { having two or more absorber surfaces}

F24J 2/05	..	surrounded by a transparent enclosure, e.g. evacuated solar collectors
F24J 2/055	...	{the enclosure being cylindrical}
F24J 2/06	..	having concentrating elements (optical elements or systems per se G02B)
F24J 2/062	...	{Prisms}
F24J 2/065	...	{Fluorescent material}
F24J 2/067	...	{Light guides}
F24J 2/07	...	Receivers working at high temperature, e.g. for solar power plants
F24J 2/08	...	having lenses as concentrating elements
F24J 2/085	....	{having discontinuous faces, e.g. Fresnel lenses}
F24J 2/10	...	having reflectors as concentrating elements
F24J 2/1047	....	{having discontinuous faces}
F24J 2/1052	....	{ flexible (F24J 2/125 , F24J 2/145 take precedence)}
F24J 2/1057	....	{ characterised by the material or the construction of the reflector}
F24J 2/12	....	parabolic
F24J 2/125	.....	{flexible}
F24J 2/13	....	hemispherical
F24J 2/14	....	semi-cylindrical or cylindro-parabolic
F24J 2/145	.....	{flexible}
F24J 2/15	....	conical
F24J 2/16	....	having flat plates
F24J 2/18	....	spaced, opposed interacting reflecting surfaces
F24J 2/20	..	the working fluid being conveyed between plates
F24J 2/201	...	{having conduits of plastic material}
F24J 2/202	...	{ having conduits formed by paired plates and internal partition means}
F24J 2/204	...	{ having conduits formed by paired plates, only one of which is plane}
F24J 2/205	...	{ having conduits formed by paired non-plane plates}
F24J 2/207	...	{having curved plate-like conduits, e.g. semi-spherical}
F24J 2/208	...	{having conduits formed by inflation of portions of a pair of joined sheets}
F24J 2/22	...	having extended surfaces, e.g. protrusions, corrugations (F24J 2/28 takes precedence)
F24J 2/23	..	the working fluid trickling freely {or flowing in a continuous film} over collector elements
F24J 2/24	..	the working fluid being conveyed through tubular heat absorbing conduits
F24J 2/242	...	{ the tubular conduits being integrated in a block; the tubular conduits touching each other}
F24J 2/243	...	{the tubular conduits being of plastic material}
F24J 2/244	...	{the tubular conduits are not fixed to heat absorbing plates and are not touching each other}
F24J 2/245	....	{the conduits being parallel to each other}
F24J 2/246	....	{the conduits being helically coiled}
F24J 2/247	....	{the conduits being spirally coiled}
F24J 2/248	....	{the conduits being otherwise bent, e.g. zig-zag}
F24J 2/26	...	having extended surfaces, e.g. protrusions (F24J 2/28 takes precedence)]

- F24J 2/265 {the conduits being parallel to each other}
- F24J 2/266 {the conduits being spirally coiled}
- F24J 2/268 {the conduits being otherwise bent, e.g. zig-zag}
- F24J 2/28 . . having permeable mass, foraminous or porous materials
- F24J 2/30 . . with means to exchange heat between plural fluids
- F24J 2/32 . . having evaporator and condenser section, e.g. heat pipe
- F24J 2/34 . . having heat storage mass
- F24J 2/345 . . . {Hot water storage}

- F24J 2/36 . Rollable or foldable collector units

- F24J 2/38 . employing tracking means ([F24J 2/02](#), [F24J 2/06](#) take precedence; direction- finders for determining the direction from which electromagnetic waves are being received [G01S 3/78](#){ , e.g. solar tracking systems [G01S 3/7861](#)}; control of position or direction [G05D 3/00](#){ , e.g. [G05D 3/105](#)})

- F24J 2/40 . Control arrangements; { Control of position for tracking [F24J 2/38](#)}
- F24J 2/402 . . {responsive to temperature}
- F24J 2/405 . . {responsive to wind}
- F24J 2/407 . . {for controlling transmission of solar radiation}

- F24J 2/42 . Solar heat systems not otherwise provided for {(solar heat systems in greenhouses [A01G 9/243](#); distillation by solar energy [C02F 1/14](#); devices for producing mechanical power from solar energy [F03G 6/00](#); central heat systems using heat solar energy [F24D 11/003](#), [F24D 11/007](#), [F24D 11/0221](#), [F24D 11/0264](#); domestic hot-water supply systems using solar energy [F24D 17/0015](#), **F24D 17/00F3**, [F24D 17/0042](#), [F24D 17/0063](#); air-conditioning systems using solar energy [F24F 5/0046](#); refrigeration machines, plants or systems using solar energy [F25B 27/002](#); drying solid materials or objects by radiation, e.g. from the sun [F26B 3/28](#))}

- F24J 2/423 . . {for swimming pools}
- F24J 2/426 . . { for showers}
- F24J 2/44 . . having thermosiphonic circulation

- F24J 2/46 . Component parts, details or accessories of solar heat collectors
- F24J 2/4607 . . { Safety or protection arrangements; Arrangements for preventing malfunction; Auxiliary devices, e.g. means for testing (control means [F24J 2/40](#))}
- F24J 2/4609 . . . {Protective covers, lids; closure members ([F24J 2/50](#) takes precedence)}
- F24J 2/461 . . . { Means for cleaning or for removing snow}
- F24J 2/4612 . . . {Means for preventing corrosion or protecting against contaminants, e.g. preventing condensations}
- F24J 2/4614 { for draining rain water}
- F24J 2/4616 { for maintaining vacuum, e.g. by using getters}
- F24J 2/4618 { for preventing condensation}
- F24J 2/462 { for deaerating or degassing the working fluid}
- F24J 2/4621 . . . { Means for overtemperature protection (arrangements for draining the working fluid: [F24J 2/4634](#)); Means for overpressure protection}
- F24J 2/4623 { Arrangements for modifying heat collecting features, e.g. by defocusing or by changing the position of heat receiving elements}

F24J 2/4625	....	{ Cooling arrangements, e.g. by using external heat dissipating means or internal cooling circuits (F24J 2/4627 takes precedence)}
F24J 2/4627	....	{ Arrangements for venting solar collector enclosures}
F24J 2/4629	....	{ Arrangements for preventing overpressure inside solar collector enclosures (F24J 2/4627 takes precedence)}
F24J 2/463	....	{ Arrangements for preventing overpressure inside solar collector circuits}
F24J 2/4632	...	{ Means for freezing protection (arrangements for draining the working fluid: F24J 2/4634)}
F24J 2/4634	...	{ Arrangements for draining the working fluid}
F24J 2/4636	...	{ Arrangements to accommodate differential expansion of solar collector elements}
F24J 2/4638	...	{ Arrangements for protecting solar collectors against adverse weather conditions (F24J 2/4609 takes precedence)}
F24J 2/464	..	{ Casings}
F24J 2/4641	...	{ characterised by using specific material}
F24J 2/4643	....	{ Plastic materials}
F24J 2/4645	....	{ Metallic materials}
F24J 2/4647	..	{ Means for fluidically interconnecting different solar collectors or for connecting solar connectors with other components; Headers; Fluid distributing means}
F24J 2/4649	..	{ Selection of particular working medium (materials for heat transfer C09K 5/00)}
F24J 2/465	..	{ Arrangements of sealing means}
F24J 2/4652	..	{ Solar heat collectors having absorber surfaces provided with special coatings, e.g. anti-reflective coatings}
F24J 2/4654	..	{ Materials for the heat-exchange conduits (F24J 2/201 , F24J 2/243 , F24J 2/48 take precedence)}
F24J 2/48	..	characterised by absorber material
F24J 2/481	...	{of metallic material (F24J 2/487 takes precedence)}
F24J 2/482	...	{of plastic (F24J 2/488 takes precedence)}
F24J 2/484	...	{of ceramic; of concrete; of natural stone (F24J 2/485 takes precedence)}
F24J 2/485	...	{using absorber coatings (radiation-absorbing paints C09D 5/32)}
F24J 2/487	....	{of metallic material}
F24J 2/488	....	{of plastic material}
F24J 2/50	..	Transparent coverings
F24J 2/505	...	{characterised by using specific material}
F24J 2/506	....	{plastic material}
F24J 2/507	...	{ using evacuated elements (F24J 2/05 takes precedence)}
F24J 2/51	..	Thermal insulation (F24J 2/50 takes precedence)
F24J 2/515	...	{characterised by the material}
F24J 2/52	..	Arrangement of mountings or supports
F24J 2/5201	...	{ Stationary supporting structures for solar modules; Load-bearing elements for movable supporting structures}
F24J 2/5203	....	{ comprising elongated rigid mounting elements, e.g. mounting profiles or rails for covering a building surface with solar modules; Module frames (F24J 2/523 takes precedence)}
F24J 2/5205	.....	{ Substantially planar profile assemblies, e.g. grids comprising coplanar

		profiles or stacked profiles}
F24J 2/5207	.....	{ comprising profiles of particular shape having in cross-section first and second module supporting portions for coupling adjacent solar modules}
F24J 2/5209	.....	{ Substantially coplanar profile assemblies comprising longitudinal profiles laterally coupled with transversal profiles}
F24J 2/5211	.....	{ Solar module peripheral frames}
F24J 2/5228	....	{ comprising plate-like mounting elements, e.g. profiled or corrugated plates; Plate-like module frames (F24J 2/523 takes precedence)}
F24J 2/523	....	{ comprising elongated standing elements, e.g. posts, legs; Standing structures for supporting solar modules at defined orientation; Three-dimensional frameworks; Volumetric supporting structures, e.g. box-like elements or shaped bodies}
F24J 2/5232	.....	{ Posts coupled with upper profiles}
F24J 2/5233	.....	{ Profile arrangements, e.g. assemblies of base profiles with vertical or inclined profiles, three-dimensional frameworks (F24J 2/5232 takes precedence)}
F24J 2/5235	.....	{ comprising bent plates or assemblies of plates}
F24J 2/5237	.....	{ comprising shaped bodies, e.g. molded box-like elements, concrete elements, foamed elements; Massive supporting structures}
F24J 2/5239	.....	{ Interconnected assemblies of stands; Stands having first and second module supporting portions for coupling adjacent modules}
F24J 2/5241	....	{ comprising elongated non rigid elements, e.g. straps, wires, ropes}
F24J 2/5243	....	{ Fixation means, e.g. connectors or fasteners}
F24J 2/5245	.....	{ Connectors for anchoring solar modules or supporting elements to the ground or to building structures}
F24J 2/5247	.....	{ in the form of bent strips or assemblies of strips; Hook-like connectors; Connectors to be mounted between building covering elements}
F24J 2/5249	.....	{ for anchoring to protrusions of buildings, e.g. to corrugations or to standing seams}
F24J 2/525	.....	{ Ground anchoring means; Foundations for supporting elements; Massive elements for anchoring supporting structures to the ground or to flat horizontal surfaces}
F24J 2/5252	.....	{ Connectors for fixing solar modules, or solar module peripheral frames to supporting elements, e.g. to profiled mounting members}
F24J 2/5254	.....	{ Solar module side connectors or base connectors}
F24J 2/5256	.....	{ Clamping or clipping elements}
F24J 2/5258	.....	{ with clamping action by using screw-threaded elements}
F24J 2/526	.....	{ Connectors for coupling adjacent supporting elements together, e.g. profile to profile connectors}
F24J 2/5262	.....	{ Connectors for coupling adjacent solar modules or solar module peripheral frames together (F24J 2/5252 takes precedence)}
F24J 2/5264	....	{ comprising means for adjusting the final position or the final orientation of a supporting element relative to another one or relative to a mounting surface; comprising means for compensating mounting tolerances}
F24J 2/5266	...	{adapted for non-rotary movement}
F24J 2/5267	...	{Waterborne solar collectors}

F24J 2/5269	....	{Moving platforms}
F24J 2/5271	...	{Airborne solar collectors, e.g. using inflated structures (F24J 2/04B16C , F24J 2/5267 take precedence)}
F24J 2/54	...	specially adapted for rotary movement {(F24J 2/5269 takes precedence)}
F24J 2/5403	....	{ with only one rotation axis}
F24J 2/5406	.....	{ with vertical axis}
F24J 2/541	.....	{ with horizontal axis}
F24J 2/5413	.....	{ with inclined axis}
F24J 2/5417	....	{ with two rotation axis}
F24J 2/542	.....	{ with vertical primary axis}
F24J 2/5424	.....	{ with horizontal primary axis}
F24J 2/5427	.....	{ with inclined primary axis}
F24J 2/5431	....	{ with more than two rotation axis or with multiple degrees of freedom }
F24J 3/00		Other production or use of heat, not derived from combustion (use of solar heat F24J 2/00)
F24J 3/003	.	{ using heat resulting from internal friction of a moving fluid or from friction between a fluid and a moving body}
F24J 3/006	..	{the fluid passing through a restriction means}
F24J 3/06	.	using natural heat
F24J 3/08	..	using geothermal heat
F24J 3/081	...	{ by circulating a working fluid through underground channels, the working fluid not coming into direct contact with the ground}
F24J 3/082	....	{ Compact tube assemblies inserted into the ground, e.g. geothermal probes}
F24J 3/083	.....	{ in the form of bent tubes or in the form of tubes assembled with connectors or with return headers}
F24J 3/084	.....	{ in the form of tubes being closed at one end, i.e. return type}
F24J 3/085	...	{ by injecting a working fluid directly into the ground or by using underground water, e.g. systems using injection and recovery wells}
F24J 3/086	...	{ by injecting a working fluid into a closed well; by using intermediate working fluids, e.g. by using heat pipes}
F24J 2002/00		Use of solar heat, e.g. solar heat collectors (distillation or evaporation of water using solar energy C02F 1/14 ; devices for producing mechanical power from solar energy F03G 6/00 ; semiconductor devices adapted for converting solar energy into electrical energy H01L 25/00 , H01L 31/04 ; semiconductor devices including arrays of solar cells using heat energy H01L 31/058 ; generators in which light radiation is directly converted into electrical energy H02N 6/00)
F24J 2002/003	.	Heat traps
F24J 2002/0038	.	Solar modules layout; Modular arrangements

- F24J 2002/0046 .. in the form of multiple rows and multiple columns, all solar modules being coplanar
- F24J 2002/0053 .. Coplanar arrangements with frame overlapping portions
- F24J 2002/0061 .. Overlaying arrangements similar to roof tiles
- F24J 2002/0069 .. Stepped arrangements, e.g. in parallel planes, without module overlapping
- F24J 2002/0076 .. Non-parallel arrangements
- F24J 2002/0084 .. Preventing shading effects
- F24J 2002/0092 .. Arrangements of solar thermal modules combined with solar PV modules

- F24J 2002/04 . Solar heat collectors having working fluid conveyed through collector
- F24J 2002/0405 .. having a particular shape, e.g. prismatic, pyramidal
- F24J 2002/0411 ... in the form of louvers
- F24J 2002/0416 ... allowing change of position for optimization of heat collection
- F24J 2002/06 .. having concentrating elements ([optical elements or systems per se G02B](#))
- F24J 2002/07 ... Receivers working at high temperature, e.g. for solar power plants
- F24J 2002/075 movable or adjustable
- F24J 2002/10 ... having reflectors as concentrating elements
- F24J 2002/1004 Special shape not covered by [F24J 2/1047](#) - [F24J 2/18](#)
- F24J 2002/1009 corrugated
- F24J 2002/1014 curved
- F24J 2002/1019 dish-shaped
- F24J 2002/1023 trough-shaped
- F24J 2002/1028 asymmetric
- F24J 2002/1033 spiral
- F24J 2002/1038 hyperbolic
- F24J 2002/1042 involutes
- F24J 2002/1061 Reflective elements inside solar collector casings
- F24J 2002/1066 Micro-reflectors
- F24J 2002/1071 in the form of reflective coatings
- F24J 2002/1076 Reflectors layout
- F24J 2002/108 Assemblies of spaced reflective elements on common support, e.g. Fresnel reflectors
- F24J 2002/1085 Reflectors formed by assemblies of adjacent similar reflective facets
- F24J 2002/109 Reflectors formed by assemblies of adjacent reflective elements having different orientation or different features
- F24J 2002/1095 Assemblies of spaced reflective elements in the form of grids, e.g. vertical or inclined reflective elements extending over heat absorbing elements

- F24J 2002/24 .. the working fluid being conveyed through tubular heat absorbing conduits
- F24J 2002/241 ... the conduits having a non-circular cross-section
- F24J 2002/26 ... having extended surfaces, e.g. protrusions ([F24J 2/28 takes precedence](#))]
- F24J 2002/261 Special fins
- F24J 2002/263 extending obliquely

- F24J 2002/38 . employing tracking means ([F24J 2/02](#), [F24J 2/06](#) take precedence; [direction- finders for determining the direction from which electromagnetic waves are being received](#)

[G01S 3/78](#){ , e.g. solar tracking systems [G01S 3/7861](#)}; control of position or direction
[G05D 3/00](#){ , e.g. [G05D 3/105](#)})

- F24J 2002/385 . . Calibration means; Methods for initial positioning of solar concentrators or solar receivers
- F24J 2002/46 . Component parts, details or accessories of solar heat collectors
- F24J 2002/4601 . . Arrangements for heat transfer optimization
- F24J 2002/4603 . . . Flow guiding means; Inserts inside conduits
- F24J 2002/4605 . . . Arrangements for one-way heat transfer, e.g. thermal diodes
- F24J 2002/4656 . . Arrangements for reinforcement of solar collector elements
- F24J 2002/4658 . . Fastening; Joining
 - F24J 2002/4659 . . . by using hook and loop-type fasteners
 - F24J 2002/4661 . . . by using hooks
 - F24J 2002/4663 . . . by clamping
 - F24J 2002/4665 . . . by clipping, e.g. by using snap connectors
 - F24J 2002/4667 . . . by screwed connection
 - F24J 2002/4669 . . . by using threaded elements, e.g. stud bolts
 - F24J 2002/467 . . . by using form-fitting connection means, e.g. tongue and groove
 - F24J 2002/4672 . . . by using toothed elements
 - F24J 2002/4674 . . . by deforming the material, e.g. by crimping or clinching
 - F24J 2002/4676 . . . by bonding, e.g. by using adhesives
 - F24J 2002/4678 . . . by welding or brazing
 - F24J 2002/4679 . . . Joining different materials
 - F24J 2002/4681 Joining glass with non-glass elements
 - F24J 2002/4683 . . Selection of particular materials
 - F24J 2002/4685 . . . Ceramics
 - F24J 2002/4687 . . . Concrete
 - F24J 2002/4689 . . . Foams
 - F24J 2002/469 . . . Carbone, e.g. graphite
 - F24J 2002/4692 . . . Plastics
 - F24J 2002/4694 . . . Textiles; Fabrics
 - F24J 2002/4696 . . . Natural materials, e.g. wood
 - F24J 2002/4698 . . . Recycled materials
- F24J 2002/50 . . Transparent coverings
 - F24J 2002/501 . . . Special shape
 - F24J 2002/502 in the form of multiple covering elements
 - F24J 2002/503 in the form of curved covering elements
 - F24J 2002/508 . . . Transparent insulation; Convection preventing members
- F24J 2002/52 . . Arrangement of mountings or supports
- F24J 2002/5201 . . . { Stationary supporting structures for solar modules; Load-bearing elements for movable supporting structures}

F24J 2002/5203	....	{ comprising elongated rigid mounting elements, e.g. mounting profiles or rails for covering a building surface with solar modules; Module frames (F24J 2/523 takes precedence)}
F24J 2002/5213	.....	Special profiles
F24J 2002/5215	.....	having hollow parts with closed cross-section
F24J 2002/5216	.....	having circular or oval cross-section
F24J 2002/5218	.....	having a central web, e.g. I-shaped, inverted T- shaped
F24J 2002/522	.....	U-, C- or O-shaped; Hat profiles
F24J 2002/5222	.....	in the form of corrugated profiles
F24J 2002/5224	.....	having curved portions
F24J 2002/5226	.....	having undercut grooves
F24J 2002/5273	...	Details; Special support components or methods
F24J 2002/5275	....	Arrangements for mounting elements inside solar collectors; Spacers inside solar collectors
F24J 2002/5277	....	Foldable support elements
F24J 2002/5279	....	Stackable support elements
F24J 2002/5281	....	Methods for installing support elements
F24J 2002/5283	....	Supports with play between elements
F24J 2002/5284	....	Filling or spacing means; Elastic means
F24J 2002/5286	....	Tensioning means
F24J 2002/5288	....	Means for preventing movements, e.g. stops
F24J 2002/529	....	Means for accommodating irregularities on mounting surface; Tolerance compensation means
F24J 2002/5292	....	Ballasting means
F24J 2002/5294	....	Sealing means between support elements and mounting surface
F24J 2002/5296	....	Sealing means between support elements, e.g. overlapping arrangements; Gap closing arrangements
F24J 2002/5298	....	Means for preventing theft; Locking means
F24J 2002/54	...	specially adapted for rotary movement {(F24J 2/5269 takes precedence)}
F24J 2002/5434	....	Special components
F24J 2002/5437	.....	Driving means
F24J 2002/5441	.....	hydraulic or pneumatic
F24J 2002/5444	.....	Coupling means
F24J 2002/5448	.....	Transmissions
F24J 2002/5451	.....	in the form of articulated bars
F24J 2002/5455	.....	in the form of compasses, scissors or parallelograms
F24J 2002/5458	.....	in the form of flexible elements, e.g. belts, chains, ropes
F24J 2002/5462	.....	in the form of gearings or rack-and-pinion transmissions
F24J 2002/5465	.....	in the form of threaded elements
F24J 2002/5468	.....	for moving several solar collectors by common transmission elements
F24J 2002/5472	.....	for deriving one movement from another one, e.g. for deriving elevation movement from azimuth movement
F24J 2002/5475	.....	Movement guiding means
F24J 2002/5479	.....	Tracks

F24J 2002/5482	.....	Bearings
F24J 2002/5486	.....	Hinged elements; Pin connections
F24J 2002/5489	.....	Spherical joints
F24J 2002/5493	.....	Load balancing means, e.g. use of counter-weights
F24J 2002/5496	.....	Movement dampening means; Braking means

F24J 2003/00 **Other production or use of heat, not derived from combustion** ([use of solar heat F24J 2/00](#))

F24J 2003/06	. using natural heat
F24J 2003/08	.. using geothermal heat
F24J 2003/087	... Component parts, details or accessories
F24J 2003/088 Methods for installation
F24J 2003/089 Control arrangements

[F24J 2200/00](#) **Prediction; Simulation**

F24J 2200/04	. for solar techniques
F24J 2200/06	. for geothermal techniques